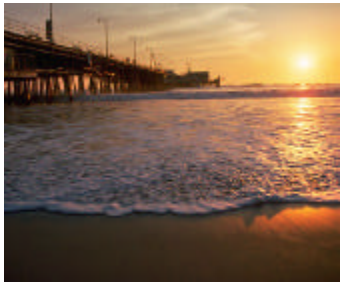
# CIRRA Task 6

## Comparative Analysis of Alternatives and Recommended Response Alternatives

November 27, 2001

ENVIRON



# GENERAL RESPONSE ALTERNATIVES

- **Alternative 1**: Drinking water replacement from outside the Charnock Sub-Basin during aquifer restoration.

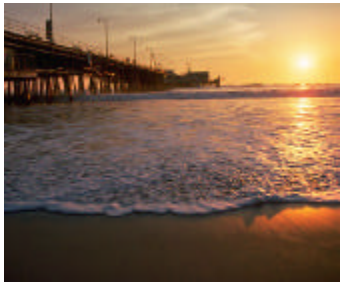
- **Alternative 2**: Provide drinking water from within the Charnock Sub-Basin, using municipal production to restore water quality.

  - Isolate the gasoline-impacted ground water to individual production wells at the COSM field followed by treatment system (well-head treatment)

  - Blend the water produced by the COSM well field into a single flow, followed by treatment (well field treatment).

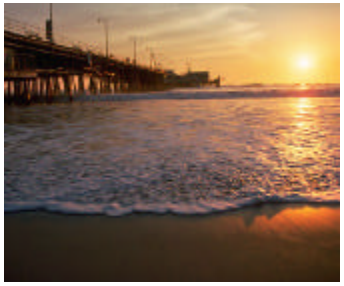
- **Alternative 3**: Well field treatment and water replacement, using municipal production to restore water quality.

- **Alternative 4**: Focused ground water (Hotspot) remediation with incremental restoration of municipal ground water production and well head treatment.



# COMPARATIVE ANALYSIS OF ALTERNATIVES

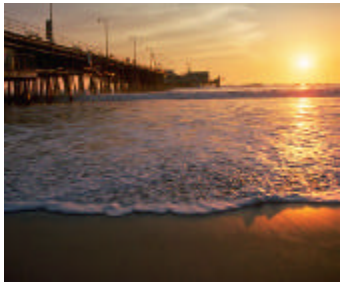
ENVIRON



# LONG-TERM RELIABILITY and EFFECTIVENESS

- "Magnitude of **residual risk**, including the adequacy and reliability of controls".
- Residual risk related to 1995 contamination in COSM well field?
  - Focuses on Northern Hotspot – southeast of COSM well field
  - Limited to Shallow and Upper Silverado aquifers
- Residual risk of other sources areas in Sub-Basin?

  Sub-Basin naturally vulnerable to water quality impacts
  - No natural confining layers over water supply aquifers
  - High rates of municipal pumping
  - Heavily developed area

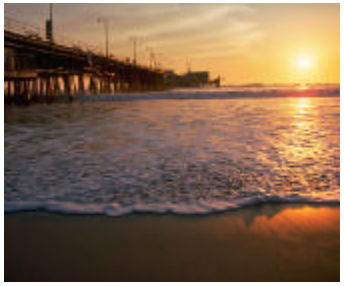


# LONG-TERM RELIABILITY and EFFECTIVENESS

Currently multiple areas of gasoline and CVOC affected ground water

Potential for future releases to migrate into capture zone of well fields

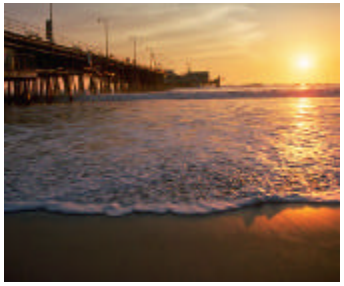
- Other areas of uncertainty
  - Nature/extent of gasoline in known areas of contamination
  - Effectiveness of municipal pumping in restoring water quality
  - Degree of water quality management practiced by COSM/SCWC
  - Subregional remediation effectiveness and timing.



# LONG-TERM RELIABILITY and EFFECTIVENESS

## GRA 1

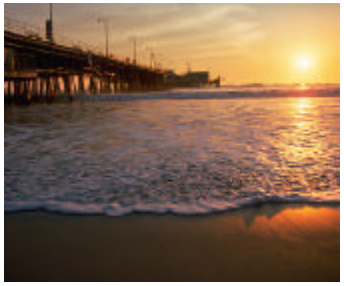
- Reduces residual risk by supplying water from outside Sub-Basin.
- Does not reduce risk of future contamination events if municipal production resumed.
- Absence of treatment leaves the COSM well field vulnerable to future shutdown



# LONG-TERM RELIABILITY and EFFECTIVENESS

## GRA 2

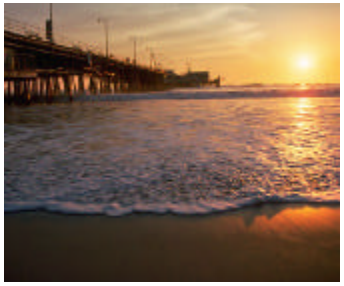
- Reduces risk by treating raw water supply
- Protects against current and future water quality impacts at least as large as the 1995 event at the COSM well field.
- Full well field production could require full well field treatment system under most conservative scenarios of future contamination.



# LONG-TERM RELIABILITY and EFFECTIVENESS

## GRA 2

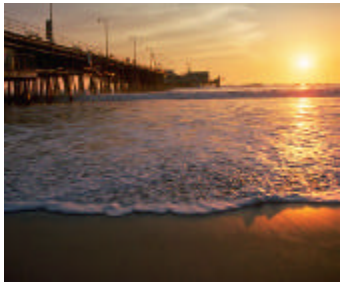
- Gasoline constituents will remain in raw water supply for at least 10-15 years.
- Restoration of production above 8,000 AFY increases risk of spreading gasoline constituents into new areas of the COSM well field.
- SCWC should remain free of gasoline constituents from 1995 event if production is no greater than 15% of COSM, and COSM production at least 4,000 AFY.



# LONG-TERM RELIABILITY and EFFECTIVENESS

## GRA 3

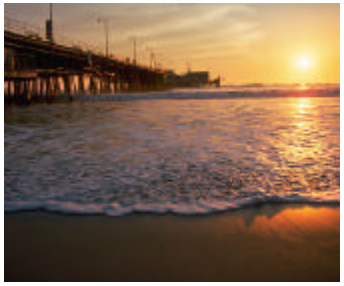
- Does not restore wellfields to historic levels of use, or fully remediate Sub-Basin water quality, in predictable time-frames.



# LONG-TERM RELIABILITY and EFFECTIVENESS

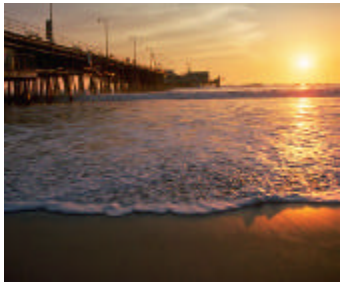
## GRA 4

- Reduces residual risk by remediating mass of gasoline-impacted ground water in the Northern Hotspot area within 4-6 years
- Municipal production incrementally restored with treatment of gasoline impacted municipal wells.
- Provides protection of continued municipal production in the event of future contamination.



# REDUCTION of TOXICITY, MOBILITY and VOLUME

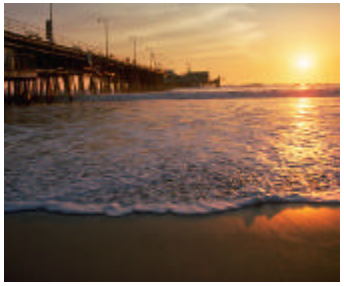
- "Treatment process used and materials treated, amount of hazardous constituents destroyed, degree of expedited reduction in toxicity, mobility, or volume, degree to which treatment is irreversible, type and quantity of residuals remaining after treatment."
- Alternatives 1A1, 1B, and GRA 3 do not effectively reduce mass of gasoline impacted ground water in the Sub-Basin
- Remediation of Northern Hotspot (Alts. 1A2 or 4) reduces regional mass in 4 to 6 years; minimal well field impacts thereafter.



# REDUCTION of TOXICITY, MOBILITY and VOLUME

- Using municipal well fields for aquifer restoration (GRA 2) will require 10-15 years; time of restoration prediction subject to large uncertainty.

- Treatment systems effectively reduce MtBE concentrations in treated water supply.

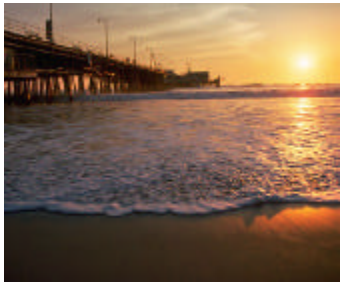


# SHORT-TERM EFFECTIVENESS

- “Protection of the community during response actions, protection of workers during response actions, environmental impacts, and response time until response action objectives are achieved.”

- Community risks for water treatment plant and remediation system construction are small.

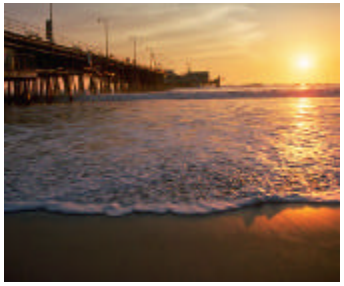
- Northern basin sites require greater construction in public highway, causing greater traffic safety and congestion impacts.



# IMPLEMENTABILITY

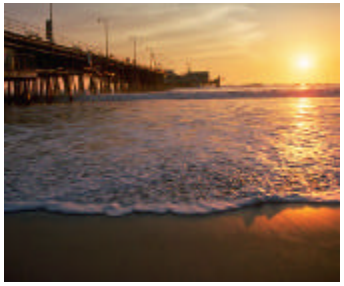
- "Ability to construct and operate technology; reliability of technology; ease of undertaking additional interim response measure(s), if necessary; ability to monitor the effectiveness of interim response measure(s); coordination with other Agencies; availability of off-site treatment, storage and disposal services and specialists to the extent required for the interim response measure(s); availability of prospective technologies; availability of land; availability of adequately trained operations and maintenance personnel and replacement equipment; logistics."

- All GRAs are implementable.



# IMPLEMENTABILITY

- Treatment technology (GAC) highly reliable and effective.
- Feasible to construct at least a moderately sized treatment plant at the COSM well field.
- Issues related to zoning and community impacts need to be resolved.

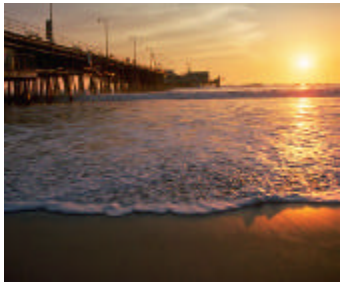


# COST

- Lowest cost alternative (1A2) relies on MWD water until aquifer quality restored by Hotspot remediation system. Does not provide protection against future well field contamination and shutdown.

- Moderate cost alternatives provide for partial (well head) treatment of well field production. Provides future protection against contamination events at least as large as in 1995.

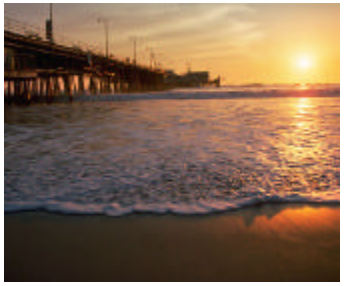
- Highest cost alternatives involve full well field treatment or prolonged periods of reduced production requiring water replacement.



# COST

- New production wells in the northern Sub-Basin are not cost effective.

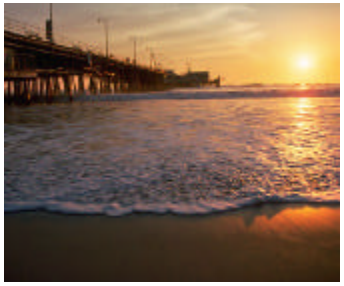
- Water treatment is less costly than water purchase once capital cost of water treatment plant is committed.



# COMMUNITY ACCEPTANCE

- “Assessment of the issues and concerns the public may have regarding each of the alternatives”.

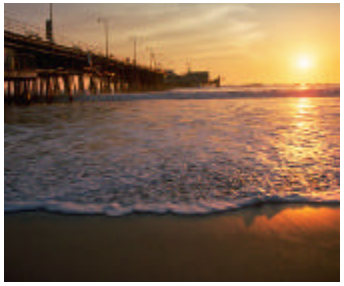
- To be assessed following public meetings and further discussions with Impacted Parties.



# CONCLUSIONS and ANALYSIS

- The treatment of at least a portion of the production of water from the COSM well field is necessary to maintain the production of the field in the event of future contamination.

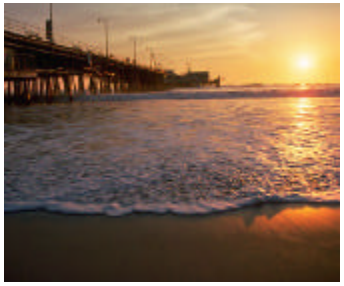
- With managed pumping the migration of gasoline constituents from the Northern Hotspot should only affect two COSM production wells (i.e. Ch-13 and 19). No less than 40 percent of the total production of the COSM field should be from these two wells at all times.



# Table 6.1-1
# Comparison of MTBE Concentration in COSM Wells vs. Pumping Rates

**Comparison of MTBE Concentration in COSM Wells vs Pumping Rates**

| | CH-13 | | CH-19 | | CH-15 | | CH-16 | | CH-18 | | Total [2] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | MTBE [1] Conc. (µg/l) | Water Extracted (acre-feet) | MTBE Conc. (µg/l) | Water Extracted (acre-feet) | MTBE Conc. (µg/l) | Water Extracted (acre-feet) | MTBE Conc. (µg/l) | Water Extracted (acre-feet) | MTBE Conc. (µg/l) | Water Extracted (acre-feet) | Water Extracted (acre-feet) | Percentage Extracted from CH-13 & CH-19 |
| Aug. 1995 | **95** | 156.2 | **8.2** | 0.0 | <5 | 178.9 | <5 | 0.0 | <5 | 96.0 | 431.2 | 36% |
| Sept. 1995 | -- | 156.8 | -- | 59.7 | -- | 181.7 | -- | 41.2 | -- | 95.4 | 534.8 | 40% |
| Oct. 1995 | **250** | 164.1 | **14** | 112.3 | -- | 190.5 | -- | 160.6 | -- | 59.7 | 687.2 | 40% |
| Nov. 1995 | -- | 139.6 | -- | 181.9 | -- | 170.1 | -- | 142.1 | -- | 0.4 | 634.1 | 51% |
| Dec. 1995 | -- | 159.4 | -- | 212.3 | -- | 197.3 | -- | 164.1 | -- | 0.0 | 733.1 | 51% |
| Jan. 1996 | -- | 140.5 | -- | 179.0 | -- | 167.9 | -- | 69.1 | -- | 0.0 | 556.6 | 57% |
| Feb. 1996 | **130** | 140.5 | **300** | 175.2 | <3 | 166.8 | -- | 68.2 | <3 | 2.2 | 552.9 | 57% |
| Mar. 1996 | **490** | 76.7 | **610** | 108.8 | <3 | 185.5 | -- | 0.0 | <3 | 131.9 | 503.0 | 37% |
| Apr. 1996 | -- | 0.0 | -- | 0.0 | **53.3** | 60.6 | <5 | 46.4 | <3 | 158.8 | 265.9 | 0% |
| May 1996 | **81.4** | 33.6 | -- | 0.0 | -- | 0.1 | <3 | 152.9 | **30.6** | 144.7 | 331.3 | 10% |
| June 1996 | -- | 0.0 | -- | 0.0 | **72.8** | 14.1 | **3.1** | 75.8 | **47.5** | 51.3 | 141.2 | 0% |
| July 1996 | -- | 0.0 | -- | 0.0 | -- | 0.0 | -- | 0.0 | -- | 0.0 | 0.0 | -- |
| Aug. 1996 | -- | 0.0 | -- | 0.0 | -- | 0.0 | -- | 0.0 | -- | 0.0 | 0.0 | -- |
| Sept. 1996 | -- | 0.0 | -- | 0.0 | -- | 0.1 | -- | 0.1 | -- | 0.1 | 0.3 | -- |
| Oct. 1996 | -- | 0.1 | -- | 0.0 | -- | 0.0 | -- | 0.0 | -- | 0.0 | 0.1 | -- |
| Nov. 1996 | -- | 0.0 | -- | 0.0 | -- | 0.0 | -- | 0.0 | -- | 0.0 | 0.0 | -- |
| Dec. 1996 | -- | 0.0 | -- | 0.0 | -- | 0.0 | -- | 0.0 | -- | 0.0 | 0.0 | -- |

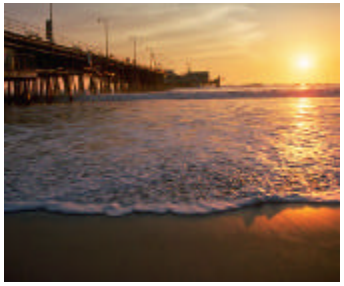


# CONCLUSIONS and ANALYSIS

- **Water produced by the remaining production wells at the COSM and SCWC well field should not be affected by the gasoline-impacted ground water in the Northern Hotspot southeast of the COSM well field if production does not exceed historic levels. SCWC production should not exceed 15% of COSM production.**

- **Focused remedial pumping of ground water from the Northern Hotspot will accelerate restoration of Sub-Basin water quality within about 4 to 6 years, allowing earlier restoration of municipal production without risk of drawing gasoline-impacted ground water into the COSM well field.**

- **Resumption of the production from the COSM/SCWC well fields should not materially degrade the performance of the Hotspot remediation system, or initiate the migration of contaminants from Sepulveda-Venice subregion, until production rates exceed 4,700 AFY.**

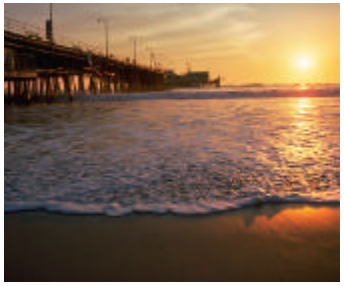


# CONCLUSIONS and ANALYSIS

- Water produced from municipal wells Ch-13 and Ch-19 at the COSM well field should be treated by a GAC treatment plant. GAC provides the most reliable and cost-effective treatment of water for gasoline constituents.

- Construction of a moderately sized water treatment plant at the COSM well field is feasible. This site is more cost-effective than alternative sites due to the proximity to the raw water supply and the availability of property owned by the COSM for construction of the plant. Potential community impacts will need to be evaluated and addressed, where applicable.

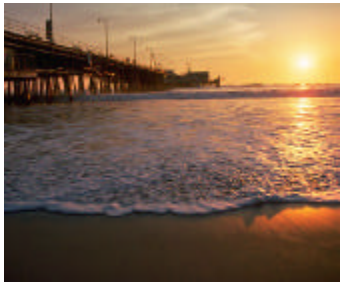
- A sentinel monitoring well and production well testing program would provide effective protection for the migration of contamination into the well fields. Barrier carbon systems are not needed to address residual contamination from the 1995 event.



# CONCLUSIONS and ANALYSIS

- A new water production well(s) in the northern portion of the Sub-Basin is not cost effective in comparison to MWD replacement water for the next 5 to 10 years.

- Ground water pump & treat systems in the Sepulveda-Venice subregion are currently containing gasoline constituents in this area, and will eventually reduce concentrations to levels that pose no further risk to municipal well fields. The performance of these systems will be degraded within no more than 3 years following restoration of municipal production to historic levels.

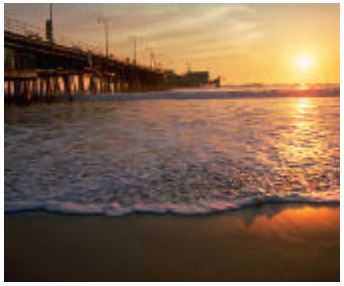


# RECOMMENDED RESPONSE ALTERNATIVE

- Permit a 4,000 AFY GAC water treatment plant at COSM well field; modular design to allow rapid expansion; initially construct 2,500 AFY capacity.
- Construct cross-over manifold, new pumps, pump controls.
- Initially treat production of CH-13 and 19 to 2,500 AFY until MtBE meets drinking water goals for 3 years. COSM maintains treatment plant thereafter for future use.
- Incrementally restore municipal production.

| | |
|---|---|
| **2004** | **1,000 AFY - COSM** |
| **2005 – 2007** | **2,500 AFY – COSM** |
| **2007 – 2009** | **4,700 AFY – COSM, SCWC** |
| **2009 - 2011** | **6,897 AFY – COSM, SCWC** |
| **2011 (est.)** | **unrestricted thereafter** |

- Supplement with MWD water as needed to supply 6,897 AFY



# RECOMMENDED RESPONSE ALTERNATIVE

- Sentinel ground water monitoring at COSM and SCWC well fields.
- Northern Hotspot remediation and ground water monitoring (2003 – 2009).
- Cost (net present value):

| | |
|---|---|
| Capital | $14,558,000 |
| O&M | $ 6,530,000 |
| Water Replacement (2002 – 2009) | $12,750,000 |
| Total | $33,838,000 |

- Continued operation of Sepulveda-Venice subregional remediation systems.